ROOF DESIGN

Technical Field of the Invention

The present invention relates to a roof design that comprises an external sheet covering, an insulating layer provided beneath the sheet covering and a load carrying structure that supports the insulating layer.

Prior Art

From DE 198 16 980 A1 a building component is previously known, said building component being manufactured by having a floating moulding material pumped into a space between a permanent mould constituting two sheet metals and an opposite mould. When the moulding material has hardened a building component is achieved where the external layer in the permanent mould constitute the external roof covering. A pipe system is also included in the building component, said system being arranged between the two sheet metals in the permanent mould. In the pipe system liquid is circulated, said liquid collecting solar energy.

Objects and Features of the Invention

A primary object of the present invention is to present a roof design where the external sheet covering is given a sufficient underlying support.

Still an object of the present invention is that the underlying support of the sheet covering has a heat insulating function.

A further object of the present invention is to avoid problems regarding condensate in the roof design.

Still an object of the present invention is to collect the solar energy that radiates into the roof design.

At least the primary object of the present invention is realised by means of a roof design that has been given the features of the pending independent claim 1. Preferred embodiments of the invention are defined in the dependent claims.

Brief Description of the Drawings

Below preferred embodiments on the invention will be described, referenced being made to the accompanying drawings, where:

Figure 1 shows a section, in the direction of the slope of the roof, through a preferred embodiment of a roof design according to the present invention;

Figure 2 shows an enlarged detail of a part of the section according to figure 1;

Figure 3 shows a schematic top view of the roof design according to figure 1, a portion of the external sheet covering has been deleted for clarity reasons;

Figure 4 shows a section along IV-IV in figure 3;

Figure 4A shows a corresponding section as in figure 4 of an alternative embodiment;

Figure 5 shows a section in the slope of the roof through a further alternative embodiment of a roof design according to the present invention;

Figure 6 shows a section, in a direction transverse the slope of the roof, through the embodiment according to figure 5;

Figure 7 shows schematically a section, in a direction transverse the slope of the roof, through a further embodiment of roof design according to the present invention,

Figure 8 shows schematically a section, in a direction transverse the slope of the roof, through a further embodiment of a roof design according to the present invention, the sheet covering and the insulating layer being somewhat separated; and

Figure 9 shows schematically a section, in a direction transverse the slope of the roof, through a further embodiment of roof design according to the present invention, the sheet covering and the insulating layer being somewhat separated.

Detailed Description of Preferred Embodiments of the Invention

The embodiment, shown in figures 1-4, of a roof design according to the present invention comprises an external sheet

covering 1, that for instance may constitute sections of sheet metal that are assembled in such a way that there is an overlap between adjacent sections. In the embodiment according to figures 1-4 the sheet covering 1 constitutes a sheet metal that has been given a tile profile.

The sheet covering 1 is supported by an insulating layer 3 that preferably constitutes self-supporting cellular plastic. Thereby, the side of the insulating layer 3 that faces towards the sheet covering 1 has been given a shape that is adapted to the sheet covering 1. Since the sheet covering 1 has a tile profile, the side of the insulating layer 3 that faces towards the sheet covering 1 has a shape comprising valleys and ridges. This brings about that the sheet covering 1 is in tight contact with the insulating layer 3.

As is evident from figure 4 the insulating layer 3 is in the shape of prefabricated elements 5 that are mutually assembled by cooperating connecting means along the edges of the elements 5. When the prefabricated elements 5 are assembled in a correct way they form a continuous bed upon which sections of sheet metal may be located and assembled to create the sheet covering 1. When assembling the elements 5 that constitute the insulating layer 3 a continuous groove 9 is also created.

As is most evident from figures 3 and 4 a flexible hose 7 is embedded in the insulating layer 3. To that purpose the insulating layer 3 is equipped with the continuous groove 9 that in the disclosed embodiment has straight portions that are interconnected by U-shaped portions. This groove configuration is of course only an example of a number of feasible variants. Generally, the groove configuration should be such that the hose 7/the groove 9 has an extension covering a major part of the surface of the insulating layer 3 that faces the sheet covering 1. The hose 7 may for instance constitute a freeze resistant elastomer. In the groove configuration shown in figures 3 and 4 the groove 9 is located in the valleys of the insulating layer 3.

The hose 7 may now be mounted in the continuous groove 9. It is favourable if the hose 7 somewhat projects above the insulating layer 3. When the sheet covering 1 is mounted on

top of the insulating layer 3 a perfect contact is established between the hose 7 and the sheet covering 1, this improving the energy exchange.

In figure 3 it is shown schematically, by means of the arrows P1 and P2, how an energy absorbing medium is supplied at one end of the hose 7 and discharged at the other end of the hose 7. The energy absorbing medium preferably constitutes a liquid. If needed an anti-freezing agent may be added to the liquid. The energy absorbing medium is preferably collected in an accumulator tank (not shown). The energy that is obtained during the day may then be used during the night.

As is most evident from figures 1 and 2 the insulating layer 3 is supported by a load carrying structure 10 that in the shown embodiment constitutes tongued and grooved boards. The sheet covering 1 and the insulating layer 3 are anchored in the load carrying structure 10 by means of through-going screws 15 that extend through the sheet covering 1 and the insulating layer 3 and reaches into the load carrying structure 10.

The roof design according to the present invention also comprises means to circulate a liquid in the hose 7. This may be effected by means of a pump. Since a relatively large amount of water may be circulated through the hose 7 the recovered energy, preferably in combination with an accumulator tank, may be used to heat tapwater and/or for floor heating. Of course an accumulator tank is not necessary but the hose may be a direct part of a heat exchange system.

In figure 4A a corresponding section is shown as in figure 4 of an alternative embodiment of a roof design according to the present invention. The principal difference between the roof according to figure 4A compared to the roof according to figure 4 is that the hose 107/the groove 109 are located on the ridges of the insulating layer 103. This means that contact between the hose 107 and the sheet covering 101 occurs at the highest points of the sheet covering 101.

In figures 5 and 6 sections are shown through an alternative embodiment of a roof design according to the present invention, said embodiment generally being more

suitable for industrial buildings. A significant feature of the roof design according to figures 5 and 6 is that the sheet covering 201 essentially constitute completely planar elements, e.g. of sheet metal, that are mutually assembled by means of welts 202. The sheet covering 201 is supported by an insulating layer 203 that also may have a substantially planar surface that is equipped with grooves, said surface facing the sheet covering 201. A hose 207 is received in the grooves and liquid is brought to circulate in the hose 207 in a corresponding way as described in connection with the embodiment according to figures 1-4.

Further examples of the design of a sheet covering, being part of the roof design according to the present invention, is shown in figures 7-9. In connection therewith the insulating layer of the roof design has been given a shape that is adapted to the sheet covering. In figures 8 and 9 the groove that receives the hose is provided in the ridges of the insulating layer.

To sum up the roof design according to the present invention offers a stable, insulating base for essentially all types of roofing sheets, regardless if they are planar or corrugated. As regards the material in the sheet covering reference is made to what is stated under the headline **Feasible Modifications of the Invention**. The roof design according to the present invention also has a groove provided in the insulating layer, a hose being received in said groove. Thereby collection and distribution of solar energy is made possible.

Feasible Modifications of the Invention

In the embodiments described above the sheet covering 1; 101; 201 is preferably manufactured from sheet metal. However, within the scope of the present invention it is also feasible that the sheet covering is manufactured from other materials. Plastic may be mentioned in exemplifying and non-restricting purpose.

In the embodiment described above according to figures 1-2 the load carrying structure 10 constitutes tongued and grooved boards. However, within the scope of the present

invention also other types of load carrying structures are feasible. Secondary spaced boarding or plywood may be mentioned in exemplifying and non-restricting purpose.

In the embodiments described above the energy absorbing medium constitutes a liquid. However, within the scope of the present invention other energy absorbing media are feasible. Air may be mentioned in exemplifying and non-restricting purpose.